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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/723,533
Filing Date: November 26, 2003
Appellant(s): BHATTACHARYA ET AL.

Nathan R. Maki, Reg. No. 51110
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 05/15/2007 appealing from the Office action mailed 08/16/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,402,004	Ozmat	3-1995
6,898,082	Dessiatoun et al.	5-2005
6,410,160	Landin et al.	6-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 32-39, 41-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozmat in view of Dessiatoun et al.

Ozmat discloses the cooling device for the integrated circuit 3, 9 coupled to substrate 11 including the thermal management device comprising an aluminum case 17 having an inlet and outlet for a cooling medium (claim 41), and a plate 13, the case 17 has a cavity (see Fig. 3) enclosing the porous medium 19 as aluminum sponge or foam (claim 37) filling substantially entire cavity attached to the plate 13 (claim 33) and is bonded to the case 17 (col.3, lines 61-63) and a cooling fluid such as water (claim 36) circulating through the porous medium in the case, and there is a watertight seal between the case and the integrated circuit; the porous medium is the metal foam made of copper or aluminum (col. 3, lines 44-49). With respect to claim 35, Ozmat discloses elongated porous material as it is shown on Fig. 2 that is showing the fiber layout; several prior art references listed in US PTO 892 Form also show the elongated microchannels which can be considered as micropores. Ozmat discloses the claimed invention except the heat exchanger and the pump. Dessiatoun discloses the thermal management device including the heat exchanger 36 and the pump 38, the inlet coupled to the pump and the outlet coupled to the heat exchanger. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to include the heat exchanger and the pump as disclosed by Dessiatoun in the device disclosed by Ozmat for cooling and circulation of the cooling medium for efficient heat removal. The details

drawn to the size of the porous medium (claims 38, 52 and 55) and the size of the integrated circuit (claim 49) would have been an obvious at the time the invention was made to a person having ordinary skill in the art, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). The intended use of the cooling device for an entertainment unit, disk player or networking interface, a dynamic random access memory or input/output interface (claims 54, 57, 58) is obvious since it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

With respect to claim 48, the thermal interface 13 is coupling the integrated circuit to the case 17.

Ozmat discloses the claimed invention except the non-uniform heat distribution or areas of high heat and the porous medium disposed in the casing with consideration of those high heat areas (claims 34, 39, 51, 56). Dessiatoun discloses the cooling device having porous medium disposed accordingly to high heat areas requiring intensified cooling medium flow (see abstract), therefore it would have been an obvious at the time the invention was made to a person having ordinary skill in the art to arrange porous medium as disclosed by Dessiatoun in the device disclosed by Ozmat to prevent overheating and eventual malfunction of the electronic device. With respect to claim 42,

the functional limitation that the pump fluid flow rate it is too slow can cause the fluid to evaporate and that will result in two-phase fluid flow is obvious.

With respect to claim 43, the substrate attached to one side and the cooling device on the opposite side is obvious and is shown in numerous prior art references listed in US PTO 892 Form and not applied at this time.

With respect to claims 44, 45 and 53, the claimed device clearly shows all elements of a typical heat pipe that is also shown in numerous prior art references listed in US PTO 892 Form that are not applied at this time. The method steps of claims 50- 53 are necessitated by the device structure as disclosed by Ozmat and modified by Dessiatoun et al.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozmat in view of Dessiatoun et al. and further in view of Landin et al.

Ozmat discloses the claimed invention except various sizes of the pores in different areas of the porous medium and porosity at or above 80%. Landin discloses a heat exchanger (see Fig. 5) having a porous material enclosed in a housing, the porosity of the material is variable and in the range from 40 to 90% (see abstract). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the porosity in range as disclosed by Landin et al. in the device disclosed by Ozmat for optimum heat conduction.

(10) Response to Argument

With respect to claims 32 and 46, the appellant's argument that Ozmat and Dessiatoun teach thermal management devices or a microporous medium are thermally coupled to

a die through one or more interposing

elements, rather than being attached to the surface of the die, is not persuasive since claims do not require those elements to be directly attached, just merely being attached as disclosed in the prior art, so examiner's decision is based on a reasonably broad interpretation of the claims.

The appellant's argument with respect to claim 34 that the recitation in the claim that the porous medium being configured based on non-uniform heat distribution over the surface of the die is differ from the combined teachings of the references, is not sufficiently substantiated; and the examiner's consideration is based on the premise that the non-uniform distribution of heat over the surface of the die is not the structural limitation in the claim and, above all, Dessiatoun discusses the non-uniform or various densities in order to provide various heat dissipation in different heat intensity areas as claimed in claim 34 (see Abstract and col. 2, lines 34-47).

With respect to the Appellant's arguments to claims 39 and 56, the response applied to claim 34 can be applied to claims 39 and 56; Appellant does not indicate where the claimed elements differ from the prior art. The both prior art references teach porous materials that clearly have variable pore diameters and densities; in Ozmat see col. 3, lines 37-56 and in Dessiatoun see col. 7, lines 29-67, col. 8, lines 1-13.

The Appellant's argument with respect to claim 42 is not sufficiently supported, and it should be noted that the functional limitation in the claim that the pump facilitates a fluid flow rate that results in two phase fluid flow is not the structural limitation and it is

obvious that the slower the flow rate the better chance to have liquid to be heated to evaporated phase.

With respect to claim 43, Appellant should consider all prior art cited by the examiner whether it is applied or not applied in the rejection, and several prior art references cited show the cooling device and the substrate are attached on opposite sides of the die to be cooled, that supports the examiner's position that such arrangement is common in the industry; and it is also obvious for any one having ordinary skill in the art that the substrate's attachment to the die on the side opposite to the thermal management device would be preferable, since the heat is primarily generated by the functioning die and not by the substrate and having cooling device attached to the die side would be preferable since it will remove heat more efficiently.

With respect to claim 47, Appellant argues that the sealant facilitating watertight seal between the case and the die is not disclosed in the prior art. The examiner considered this limitation in the claim in reasonably broad terms; the housing formed by elements 13, 16 and 18 provide the sufficient seal between the die and the thermal management device 17, 19 and also it is inherently required to seal the liquid accessible portion of a cooling device from electronic device to avoid leaks, shorts and corrosion.

Appellant also arguing that the prior art does not teach or teach away from use of micro-scaled porous medium, as claimed in claim 46. There is no "micro-scaled " porous material claimed in claim 46, and there is no certain range in which the size of pores of the porous material can be considered as microporous is established in the claim or in the specification. The examiner's consideration is based on broad interpretation of the

teachings of the prior art, which disclose the compressed sponges or foams providing porous environment for coolant to travel therethrough by either pumping or capillary attraction.

For the above reasons, it is believed that the rejections should be sustained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

Respectfully submitted,

Boris L. Chervinsky, Primary Examiner

Conferees:

Jayprakash N. Gandhi, SPE

David S. Blum, Primary Examiner